Alaska Fisheries Data Series Number 2002-2

Estimation of the Sockeye Salmon Escapement into McLees Lake, Unalaska Island, Alaska, 2001

by

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February 2002

This Project (FIS 01-059) was funded under Cooperative Agreement 701811J332 between the U.S. Fish and Wildlife Service, Office of Subsistence Management and Kenai Fishery Resource Office and the Qawalangin Tribe of Unalaska.

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Abstract.—From June 15 to July 30, 2001, a flexible picket weir was used to collect abundance, run timing, and biological data from sockeye salmon returning to McLees Lake on Unalaska Island. A total of 45,866 sockeye *Oncorhynchus nerka*, one chinook *O. tshawytscha*, and one coho *O. kisutch* salmon were counted through the weir. Peak passage occurred during the last week in June and the first week in July when 25,868 (56%) sockeye salmon entered McLees Lake. The sockeye salmon return to McLees Lake during 2001 was much larger than anticipated based on aerial survey counts in past years which ranged from 300-11,000 fish.

Seven age groups were identified from 480 sockeye salmon sampled from the weir escapement between June 19 and July 16. This escapement was composed primarily of age 1.3 (94.5%) and 1.2 (3.8%) fish. Females composed an estimated 41.9% of the sampled sockeye salmon escapement. Age composition did not differ between sexes.

Introduction

McLees Lake empties into Reese Bay on the north side of Unalaska Island approximately 12 miles NW of the city of Unalaska (Figure 1). This watershed provides important spawning and rearing habitat for sockeye salmon. Adult sockeye salmon returning to McLees Lake are harvested in Reese Bay by subsistence users from Unalaska. The Reese Bay subsistence fishery currently provides 80-90 % of the annual sockeye harvest for this community (Arnie Shaul, Alaska Department of Fish and Game, personal communication) and the number of households participating in this fishery has increased in recent years (Appendix 1). Current management of the fishery is limited to using aerial surveys and harvest information to assess escapement.

The escapement of sockeye salmon to McLees Lake has been monitored using aerial survey counts since 1974 (Arnie Shaul, Alaska Department of Fish and Game, personal communication). Aerial surveys have generally been limited to one survey each year and have ranged from 300 - 11,000 fish (Appendix 2). This wide fluctuation in numbers can be attributed to several factors including time of survey, poor weather, remoteness, lack of availability of suitable aircraft, variation among observers, and high cost of aircraft charters. No aerial surveys were conducted during some years because of one or more of these factors. Results from these surveys are incomplete and prohibit any meaningful comparisons of run strength among years.

Subsistence harvests of sockeye salmon returning to McLees Lake have been monitored since 1985 (Shaul and Dinnocenzo

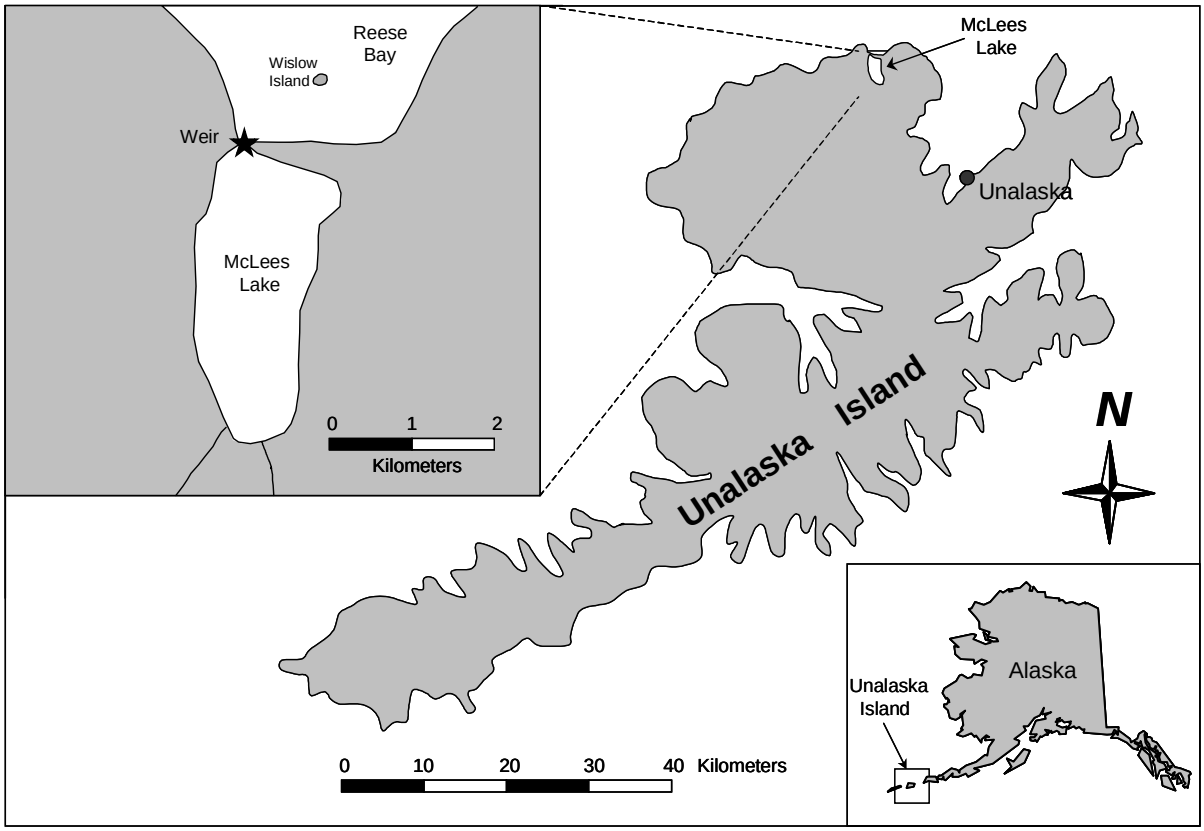

FIGURE 1.—Map of Unalaska Island showing the location of McLees Lake and the weir site.

2001). The estimated annual harvest in the Reese Bay subsistence fishery has ranged from 436 to 3,985 sockeye salmon (Appendix 1). During this time period the number of permits issued for this fishery has ranged from 12 to 121. Annual fluctuations in harvest have generally corresponded to the number of permits issued for the fishery. Since 1995, the average annual harvest has nearly doubled and the number of permits issued has nearly tripled from that observed from 1985-1994. These numbers suggest that sockeye salmon returning to McLees Lake have become increasingly important to the local subsistence fishery.

Local residents and the Alaska Department of Fish and Game (Department) have expressed concerns that the lack of an escapement estimate for sockeye salmon into McLees Lake may jeopardize the health of the run, as well as future opportunities for subsistence fishing. These concerns prompted the Kodiak/Aleutian Federal Regional Subsistence Advisory Council to identify an escapement monitoring project on McLees Lake as a high priority. To address these concerns, the Kenai Fishery Resource Office (Kenai FRO) and the Qawalangin Tribe of Unalaska entered into a partnership agreement during 2001 to monitor the sockeye salmon return to McLees Lake over a 3-year period. Specific objectives of the project during 2001 were to: (1) enumerate the daily passage of sockeye salmon through a flexible picket weir; (2) describe the run-timing of sockeye salmon through the weir; (3) estimate the weekly sex and age composition of the sockeye salmon return; and, (4) estimate the mean length of sockeye salmon by sex and age.

Methods

Weir Design and Operation

A flexible picket weir spanning 21 m was installed at the outlet of McLees Lake and operated from June 15 to July 30, 2001. The weir was patterned after a design used on the Alaska Peninsula (Nick Hetrick, U.S. Fish and Wildlife Service, personal communication). Weir pickets are electrical metal conduit with a 1.3 cm inside diameter. Picket spacing ranged from 3.5 cm for panels in shallow water near each stream bank to 2.2 cm on panels near the middle of the McLees Lake outlet channel. All pickets are 1.5 m long and strung together with 3-mm aircraft cable to make panels 3 m long (Appendix 3). A spanning cable (6-mm aircraft) was strung bank to bank and pulled tight about 0.3 m above the surface of the water. The weir panels were leaned against the cable which was supported with a single tripod in mid-channel and fenceposts approximately every 3 meters (Appendix 4). A trap and holding area was constructed into the upstream side of the weir to facilitate sampling fish and passing adult salmon through the weir. The weir and sampling trap was inspected daily and maintained as needed to insure integrity.

A staff gauge was installed 4 m downstream of the weir to measure daily water levels. Water temperatures were monitored in the outlet channel with a StowAway® TidbiT® temperature logger.

Escapement Counts

Fish were passed and counted intermittently between 0700 and 2400 hours each day. The duration of each counting session varied depending on the intensity of fish passage through the weir. Daily escapement counts were relayed to Kenai FRO via satellite phone. Kenai FRO provided daily escapement information (E-mail) to the Department in Cold Bay, allowing for possible in-season management decisions of the Reese Bay subsistence fishery.

Biological Sampling

Data on fish age, sex, and length (ASL) were collected using a temporally stratified sampling design (Cochran 1977), with statistical weeks defining strata. A sample of fish was collected weekly for ASL information. Sampling typically occurred during two or three days during each statistical week in an effort to obtain a weekly sub-sample of 100 sockeye salmon.

Fish sampling consisted of measuring length, determining sex, collecting scales, and then releasing the fish upstream of the weir. Length was measured from mid-eye to fork-of-caudal-fin to the nearest 5 mm. Sex was determined by observing external characteristics. Scales were removed from the preferred area for age determination (Koo 1962; Mosher 1968). One scale was collected from each sockeye salmon.

Sample data for salmon were recorded on all-weather age, sex, length (ASL) field forms and transferred to ASL mark-sense forms provided by the Department. Salmon scales were cleaned and properly affixed to gummed scale cards. Mark-sense forms and scale cards were completed according to Department procedures for the Alaska Peninsula/Aleutian Islands Area (Murphy 2000). At the end of the season, mark-sense forms and scale cards were forwarded to the Department in Kodiak to determine age from the scales and enter age data onto the ASL forms. The Department scanned the completed forms and provided a synopsis of the ASL data to Kenai FRO.

Data Analysis

Mean lengths of males and females by age were compared using a two-tailed *t* test at " =0.05 (Zar 1984). Age and sex composition were estimated using a stratified sampling design (Cochran 1977). Chi-square contingency table analysis was used to test for differences in age composition between the sexes. Because the standard test only applies to data collected under simple random sampling, adjustments were made to the test statistic, following Rao and Thomas (1989), to account for the impact of our stratified sampling design on the results. The O^2 statistic, hereafter referred to as $O^2(\$.)$, was divided by the mean generalized design effect, $\$.$, as a first-order correction to the standard test (Rao and Thomas 1989). Estimated design effects for the cells and marginals are presented in the results. Age and sex specific escapements in a stratum, $\hat{A}_{hij}$, and their variances, $V[\hat{A}_{hij}]$, were estimated as:

$$\hat{A}_{hij} = N_h \hat{p}_{hij} ; \qquad \textbf{(1)}$$

and

$$\hat{V}[\hat{A}_{hij}] = N_h^2 \left(1 - \frac{n_h}{N_h}\right)\left(\frac{\hat{p}_{hij}(1-\hat{p}_{hij})}{n_h - 1}\right) \qquad \textbf{(2)}$$

where

N_h = total escapement of a given species during stratum *h*;

$\hat{p}_{hij}$ = estimated proportion of age *i* and sex *j* fish, of a given species, in the sample in stratum *h*; and

n_h = total number of fish, of a given species, in the sample for stratum *h*.

Abundance estimates and their variances for each stratum were summed to obtain age- and sex- specific escapements for the season as follows:

$$\hat{A}_{ij} = \sum \hat{A}_{hij} ; \qquad \textbf{(3)}$$

and

$$\hat{V}[\hat{A}_{ij}] = \sum \hat{V}(\hat{A}_{hij}) ; \qquad \textbf{(4)}$$

where

$\hat{A}_{ij}$ = estimated total escapement for age *i* and sex *j* fish of a given species.

Results

Weir Design and Operation

The weir was functional throughout the operational period. No holes were reported, water levels did not exceed the height of the weir, and no salmon were observed escaping through the pickets. The sampling trap worked well when stage heights exceeded 45 cm, but was not effective in passing or sampling fish at lower stage heights. Stage heights less than 45 cm occurred from July 17-30 (Appendix 5). During lower stage heights, fish were counted past the weir by rolling back a flexible panel to create a 1.5 m opening in the weir. No biological samples were collected after July 16. Water temperatures during weir operations ranged from 11.0 to 13.6 °C and averaged 12.5 °C (Appendix 5).

Biological Data

Three species of Pacific salmon, including 45,866 sockeye, one chinook, and one coho salmon, were counted upstream through the weir (Appendix 6). Sockeye salmon passed through the weir from June 15 to July 30. Peak passage occurred during the last week in June and the first week in July when 25,868 (56%) sockeye salmon entered McLees Lake (Figure 2; Appendix 6). Counts of sockeye salmon did not exceed 100 fish per day after July 22. The coho (N=1) and chinook salmon (N=1) were observed passing the weir on July 12 and 19, respectively.

Seven age groups were identified from 379 out of 480 sockeye salmon sampled from the weir escapement between June 19 and July 16 (Appendix 7). During this period, 44,135 sockeye salmon were counted through the weir. Age 1.3 sockeye salmon were most abundant, accounting for 94.5 % of all sampled fish. Females made up an estimated 41.9 % of the sockeye escapement. Age composition did not differ between sexes (P>0.05). In sampled fish, the mean length of age 1.3 males (582 mm) was greater than the mean length (552 mm) of same-aged females (two-tailed t test: age 1.2, t=0.733, df= 13, P=0.477; age 1.3, t=13.748, df=353, P<0.001; insufficient data for other age groups)(Appendix 8).

Discussion

Weir Operation

We originally planned to operate the weir from June 1 through mid-August, however, because of a delay in finalizing the land lease agreement with Ounalashka Corporation, we were not able to install the weir until June 15. This delay caused us to miss the beginning of the run, but the weir was installed prior to peak passage which occurred during late June and early July (Figure 2). After July 22, fish passage declined substantially and the weir was removed on July 31. We plan to have the weir installed by June 1 for the 2002 field season.

The flexible picket weir was a good design for monitoring the salmon escapement into McLees Lake. The weir was initially installed using a picket spacing of 3.5 cm on all panels, however, we quickly discovered that during times of higher passage, some fish would charge the weir and get stuck between the pickets. This problem was corrected during the first few days of weir operation by reducing picket spacing to 2.2 cm on panels near the middle of the McLees Lake outlet channel.

The trap worked well for sampling fish when stage heights exceeded 45 cm, but was not effective in passing or sampling fish at lower stage heights. No biological sampling was conducted after July 17 when stage heights dropped below 45 cm. We will try to resolve this problem next year by installing the trap in deeper water at the beginning of the season.

Biological Data

The magnitude of the sockeye salmon return to McLees Lake during 2001 (N=45,866) was much larger than anticipated based on aerial survey counts in past years. Aerial surveys conducted on the McLees Lake watershed from 1974 through 2000 have ranged from 300 - 11,000 fish (Appendix 2). An aerial survey conducted by the Department during mid-August 2001 resulted in a count of 34,000 sockeye in the McLees Lake spawning tributaries (Arnie Shaul, Alaska Department of Fish and Game, personal communication). This index count is the highest count observed

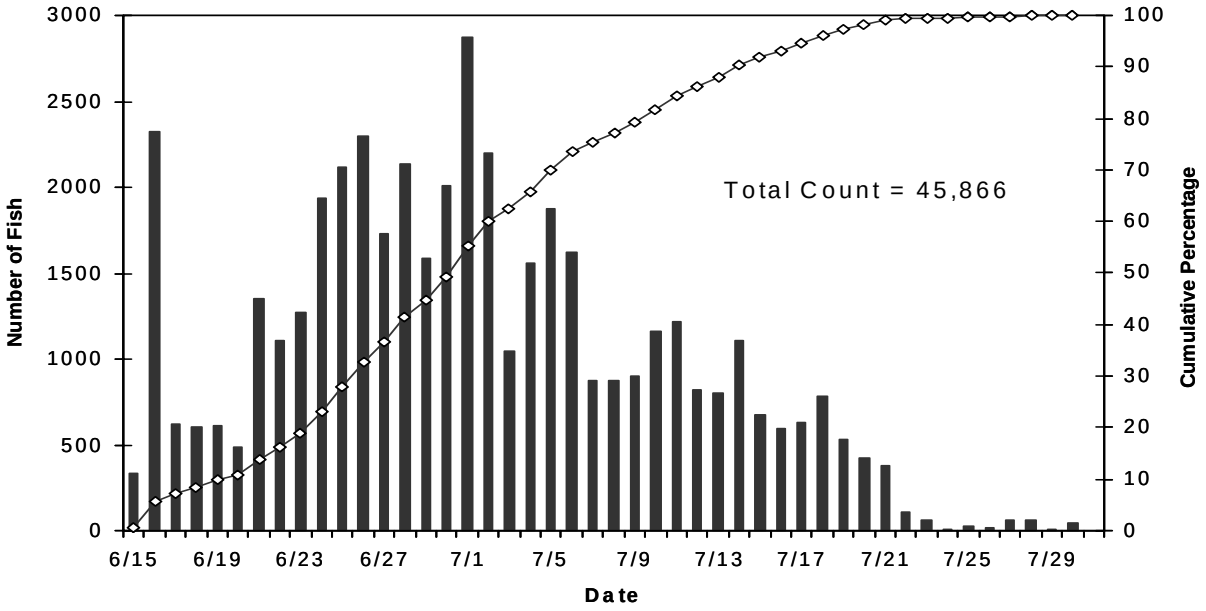

FIGURE 2.—Adult sockeye salmon counts through the McLees Lake weir, Unalaska Island, Alaska, 2001.

since 1974 and is more aligned with the escapement observed at the weir. The number of sockeye counted past the weir is a conservative estimate of total escapement since the weir was not installed until June 15 and good numbers of sockeye were counted into the lake during the first few days of operation. A better estimate of total escapement will be obtained next season by installing the weir on June 1.

Although seven age groups were identified from sockeye salmon sampled at the weir, age 1.3 fish were most abundant, accounting for 94.5 % of all sampled fish (Appendix 7). Since these are the only age data available for this system, it is unclear if the dominance of this age class is typical for this system. Other sockeye populations on the Alaska Peninsula and in nearby Summer Bay on Unalaska Island typically have at least two or three age groups comprising the majority of fish (Matt Foster, Alaska Department of Fish and Game, personal communication).

Acknowledgments

Special appreciation is extended to those who contributed to this project: Frank Harris was responsible as crew leader for data collection and daily weir operation; Kenny McGlashan and Leonty Merculieff III staffed the weir; Charlie Weeks assisted with setting up the field camp and installing the weir. A special thanks is extended to George Pletnikoff, environmental coordinator for the Qawalangin Tribe, who was instrumental in fulfilling tribal responsibilities for the project.

We also appreciate the assistance of the Alaska Department of Fish and Game (Department). Forrest Bowers, local area management biologist with the Department, provided a skiff and personnel to transport groceries and supplies from Dutch Harbor to the weir site during June and July. The Department also provided bunkhouse space for the crew in Dutch Harbor at the beginning and end of field operations. Thanks is also extended to Patti Nelson and Matt Foster with

the Department in Kodiak for scale sample analysis.

Funding for the project was provided by the Office of Subsistence Management, U.S. Fish and Wildlife Service.

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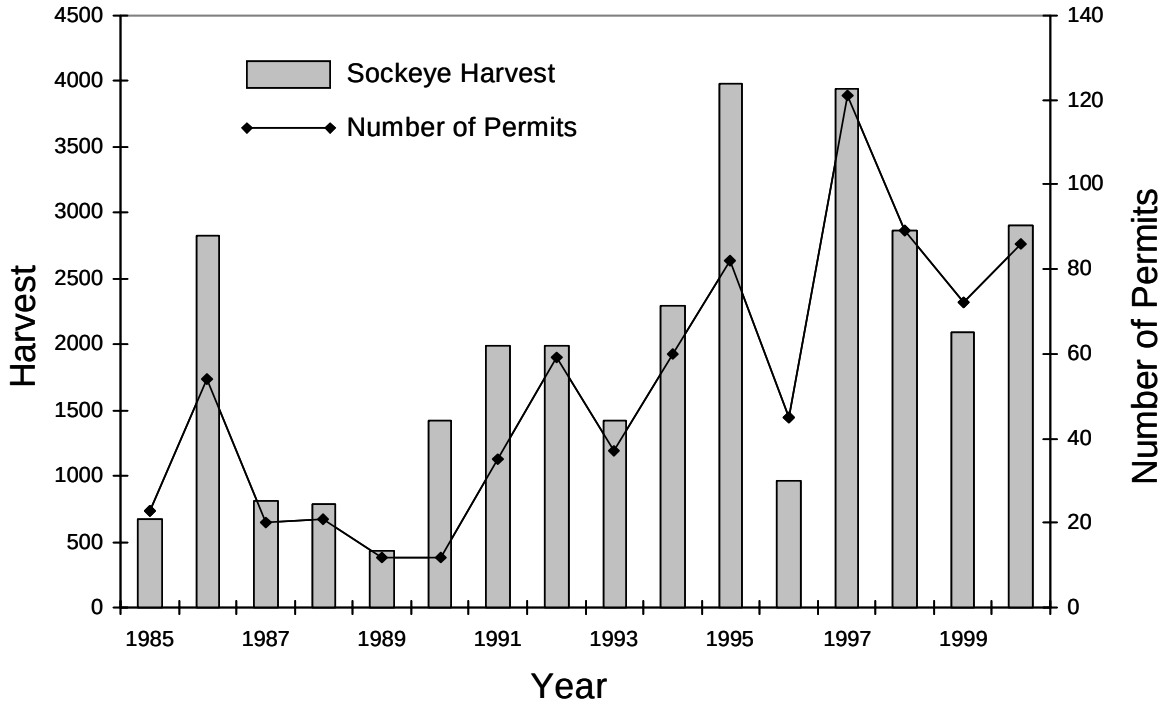
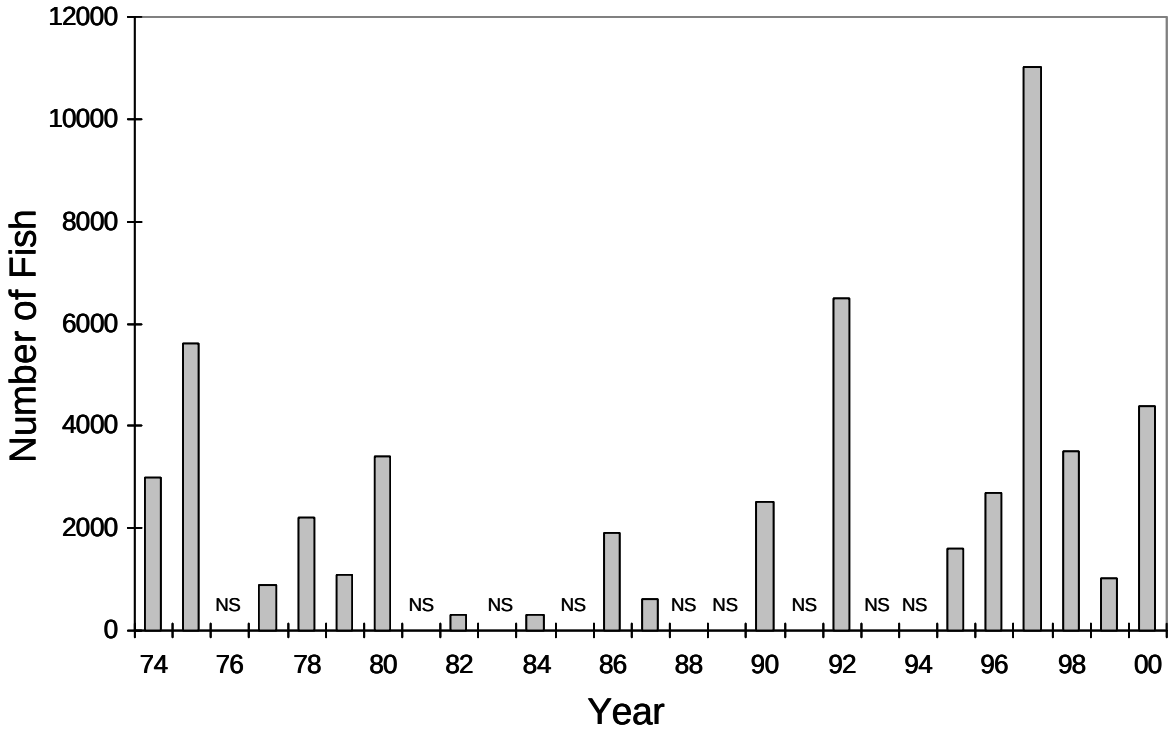
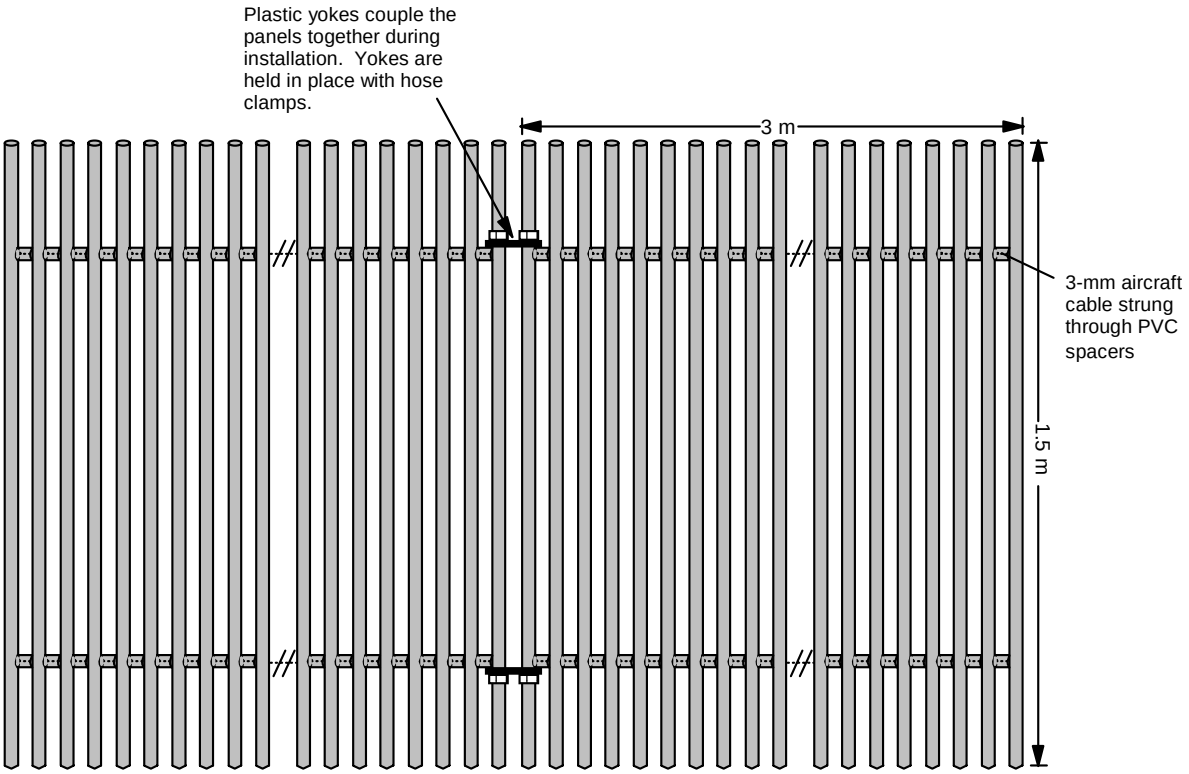


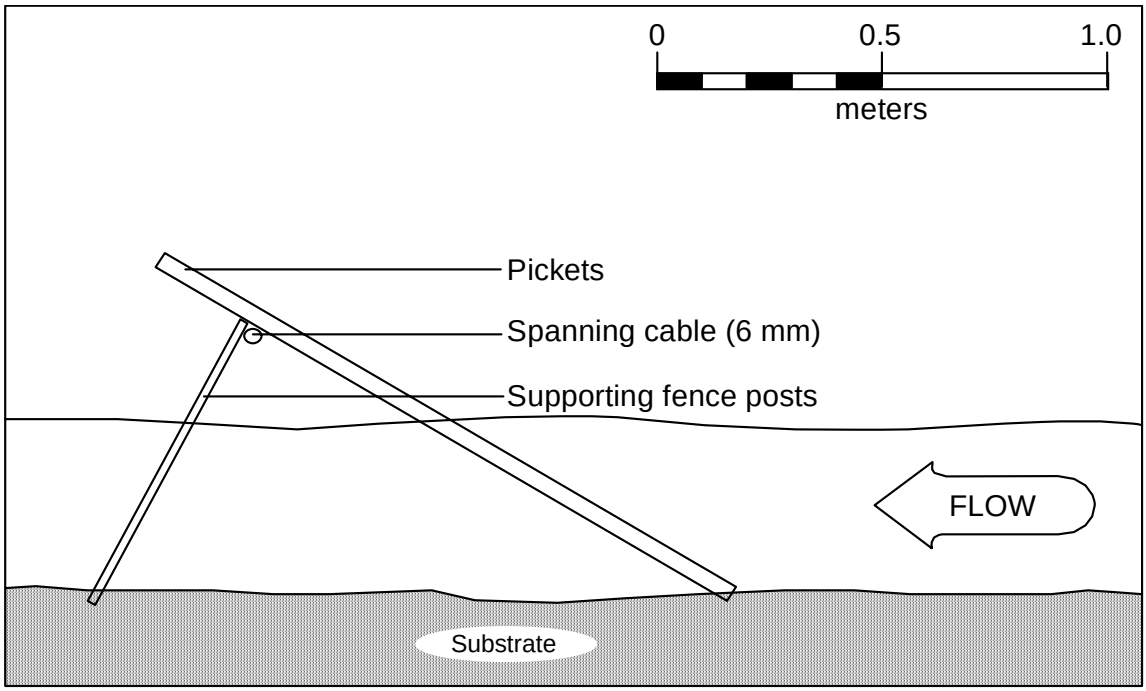
APPENDIX 1.—Estimated harvest of sockeye salmon and number of permits issued for the Reese Bay subsistence fishery 1985-2000 (Shaul and Dinnocenzo 2001).



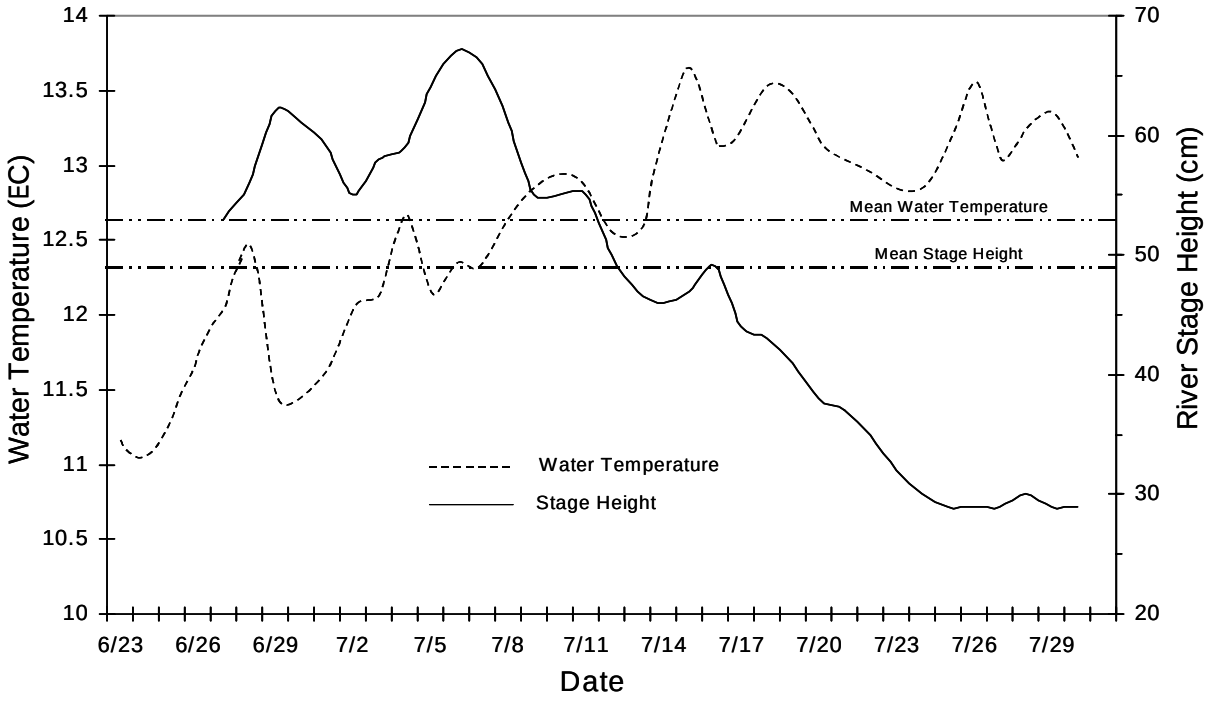
APPENDIX 2.—Aerial index escapement counts of sockeye salmon for the McLees Lake watershed, Unalaska Island, Alaska. NS denotes years when no survey was conducted.



APPENDIX 3.—Weir panels with pickets constructed from electrical metal conduit with a 1.3 cm inside diameter and strung together with 3-mm aircraft cable.



APPENDIX 4.—Lateral view of an installed weir panel. Spanning cable is anchored to both banks and pulled tight so it does not sag into the water. Fence posts and one tripod support the cable so the weight of the weir does not cause the panels to submerge.



APPENDIX 5.—Water temperature and river stage height at the McLees Lake weir, Unalaska Island, 2001.

APPENDIX 6.—Daily counts, cumulative counts, and cumulative proportion of sockeye, coho, and chinook salmon escapements through McLees Lake weir, 2001. Boxed areas encompass the second quartile, median, and third quartile of the sockeye salmon escapement.

	Sockeye Salmon			Coho Salmon			Chinook Salmon		
	Daily	Cumulative		Daily	Cumulative		Daily	Cumulative	
Date	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion
6/15	331	331	0.007	0	0	0.000	0	0	0.000
6/16	2,321	2,652	0.058	0	0	0.000	0	0	0.000
6/17	626	3,278	0.071	0	0	0.000	0	0	0.000
6/18	603	3,881	0.085	0	0	0.000	0	0	0.000
6/19	613	4,494	0.098	0	0	0.000	0	0	0.000
6/20	488	4,982	0.109	0	0	0.000	0	0	0.000
6/21	1,347	6,329	0.138	0	0	0.000	0	0	0.000
6/22	1,106	7,435	0.162	0	0	0.000	0	0	0.000
6/23	1,270	8,705	0.190	0	0	0.000	0	0	0.000
6/24	1,938	10,643	0.232	0	0	0.000	0	0	0.000
6/25	2,118	12,761	0.278	0	0	0.000	0	0	0.000
6/26	2,301	15,062	0.328	0	0	0.000	0	0	0.000
6/27	1,729	16,791	0.366	0	0	0.000	0	0	0.000
6/28	2,138	18,929	0.413	0	0	0.000	0	0	0.000
6/29	1,585	20,514	0.447	0	0	0.000	0	0	0.000
6/30	2,008	22,522	0.491	0	0	0.000	0	0	0.000
7/1	2,876	25,398	0.554	0	0	0.000	0	0	0.000
7/2	2,200	27,598	0.602	0	0	0.000	0	0	0.000
7/3	1,046	28,644	0.625	0	0	0.000	0	0	0.000
7/4	1,558	30,202	0.658	0	0	0.000	0	0	0.000
7/5	1,872	32,074	0.699	0	0	0.000	0	0	0.000
7/6	1,623	33,697	0.735	0	0	0.000	0	0	0.000
7/7	876	34,573	0.754	0	0	0.000	0	0	0.000
7/8	871	35,444	0.773	0	0	0.000	0	0	0.000
7/9	902	36,346	0.792	0	0	0.000	0	0	0.000
7/10	1,164	37,510	0.818	0	0	0.000	0	0	0.000
7/11	1,213	38,723	0.844	0	0	0.000	0	0	0.000
7/12	816	39,539	0.862	1	1	1.000	0	0	0.000
7/13	805	40,344	0.880	0	1	1.000	0	0	0.000
7/14	1,110	41,454	0.904	0	1	1.000	0	0	0.000
7/15	675	42,129	0.919	0	1	1.000	0	0	0.000
7/16	595	42,724	0.931	0	1	1.000	0	0	0.000
7/17	627	43,351	0.945	0	1	1.000	0	0	0.000
7/18	784	44,135	0.962	0	1	1.000	0	0	0.000
7/19	528	44,663	0.974	0	1	1.000	1	1	1.000
7/20	420	45,083	0.983	0	1	1.000	0	1	1.000
7/21	378	45,461	0.991	0	1	1.000	0	1	1.000
7/22	106	45,567	0.993	0	1	1.000	0	1	1.000
7/23	67	45,634	0.995	0	1	1.000	0	1	1.000
7/24	6	45,640	0.995	0	1	1.000	0	1	1.000
7/25	24	45,664	0.996	0	1	1.000	0	1	1.000
7/26	16	45,680	0.996	0	1	1.000	0	1	1.000
7/27	64	45,744	0.997	0	1	1.000	0	1	1.000
7/28	67	45,811	0.999	0	1	1.000	0	1	1.000
7/29	13	45,824	0.999	0	1	1.000	0	1	1.000
7/30	42	45,866	1.000	0	1	1.000	0	1	1.000

APPENDIX 7.—Estimated age and sex composition of weekly sockeye salmon escapements through the McLees Lake weir, 2001; and estimated design effects of the stratified sampling design.

		Brood Year and Age Class							
		1997		1996			1995		
		0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Stratum 1: 06/14-06/20									
Sampling Dates: 06/19, 06/20									
Female:	Number in Sample:	0	0	0	23	0	0	0	23
	Estimated % of Escapement:	0.0	0.0	0.0	37.7	0.0	0.0	0.0	37.7
	Estimated Escapement:	0	0	0	1,878	0	0	0	1,878
	Standard Error:	0.0	0.0	0.0	309.8	0.0	0.0	0.0	
Male:	Number in Sample:	0	1	0	36	0	0	1	38
	Estimated % of Escapement:	0.0	1.6	0.0	59.0	0.0	0.0	1.6	62.3
	Estimated Escapement:	0	82	0	2,940	0	0	82	3,104
	Standard Error:	0.0	81.2	0.0	314.4	0.0	0.0	81.2	
Total:	Number in Sample:	0	1	0	59	0	0	1	61
	Estimated % of Escapement:	0.0	1.6	0.0	96.7	0.0	0.0	1.6	100.0
	Estimated Escapement:	0	82	0	4,819	0	0	82	4,982
	Standard Error:	0.0	81.2	0.0	113.8	0.0	0.0	81.2	
Stratum 2: 06/21-06/27									
Sampling Dates: 06/21, 06/23, 06/24									
Female:	Number in Sample:	0	2	0	39	0	0	0	41
	Estimated % of Escapement:	0.0	2.3	0.0	44.8	0.0	0.0	0.0	47.1
	Estimated Escapement:	0	271	0	5,294	0	0	0	5,565
	Standard Error:	0.0	190.1	0.0	630.9	0.0	0.0	0.0	
Male:	Number in Sample:	0	3	0	42	0	1	0	46
	Estimated % of Escapement:	0.0	3.4	0.0	48.3	0.0	1.1	0.0	52.9
	Estimated Escapement:	0	407	0	5,701	0	136	0	6,244
	Standard Error:	0.0	231.5	0.0	634.0	0.0	135.2	0.0	
Total:	Number in Sample:	0	5	0	81	0	1	0	87
	Estimated % of Escapement:	0.0	5.7	0.0	93.1	0.0	1.1	0.0	100.0
	Estimated Escapement:	0	679	0	10,995	0	136	0	11,809
	Standard Error:	0.0	295.3	0.0	321.5	0.0	135.2	0.0	
Stratum 3: 06/28-07/04									
Sampling Dates: 07/01, 07/02									
Female:	Number in Sample:	0	0	0	29	0	0	0	29
	Estimated % of Escapement:	0.0	0.0	0.0	39.2	0.0	0.0	0.0	39.2
	Estimated Escapement:	0	0	0	5,256	0	0	0	5,256
	Standard Error:	0.0	0.0	0.0	764.1	0.0	0.0	0.0	
Male:	Number in Sample:	0	2	0	43	0	0	0	45
	Estimated % of Escapement:	0.0	2.7	0.0	58.1	0.0	0.0	0.0	60.8
	Estimated Escapement:	0	362	0	7,793	0	0	0	8,155
	Standard Error:	0.0	253.8	0.0	772.3	0.0	0.0	0.0	
Total:	Number in Sample:	0	2	0	72	0	0	0	74
	Estimated % of Escapement:	0.0	2.7	0.0	97.3	0.0	0.0	0.0	100.0
	Estimated Escapement:	0	362	0	13,049	0	0	0	13,411
	Standard Error:	0.0	253.8	0.0	253.8	0.0	0.0	0.0	

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APPENDIX 7.—(Page 2 of 2)

		Brood Year and Age Class							
		1997		1996			1995		
		0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
Stratum 4: 07/05-07/11									
Sampling Dates: 07/06, 07/07, 07/08									
Female:	Number in Sample:	0	2	0	23	0	0	0	25
	Estimated % of Escapement:	0.0	2.7	0.0	30.7	0.0	0.0	0.0	33.3
	Estimated Escapement:	0	227	0	2,613	0	0	0	2,840
	Standard Error:	0.0	158.9	0.0	454.7	0.0	0.0	0.0	
Male:	Number in Sample:	0	0	0	49	1	0	0	50
	Estimated % of Escapement:	0.0	0.0	0.0	65.3	1.3	0.0	0.0	66.7
	Estimated Escapement:	0	0	0	5,567	114	0	0	5,681
	Standard Error:	0.0	0.0	0.0	469.3	113.1	0.0	0.0	
Total:	Number in Sample:	0	2	0	72	1	0	0	75
	Estimated % of Escapement:	0.0	2.7	0.0	96.0	1.3	0.0	0.0	100.0
	Estimated Escapement:	0	227	0	8,180	114	0	0	8,521
	Standard Error:	0.0	158.9	0.0	193.3	113.1	0.0	0.0	
Stratum 5: 07/12-07/18									
Sampling Dates: 07/12, 07/13, 07/16									
Female:	Number in Sample:	1	4	1	35	1	0	3	45
	Estimated % of Escapement:	1.2	4.9	1.2	42.7	1.2	0.0	3.7	54.9
	Estimated Escapement:	66	264	66	2,310	66	0	198	2,970
	Standard Error:	65.5	128.5	65.5	295.2	65.5	0.0	112.0	
Male:	Number in Sample:	0	1	0	36	0	0	0	37
	Estimated % of Escapement:	0.0	1.2	0.0	43.9	0.0	0.0	0.0	45.1
	Estimated Escapement:	0	66	0	2,376	0	0	0	2,442
	Standard Error:	0.0	65.5	0.0	296.2	0.0	0.0	0.0	
Total:	Number in Sample:	1	5	1	71	1	0	3	82
	Estimated % of Escapement:	1.2	6.1	1.2	86.6	1.2	0.0	3.7	100.0
	Estimated Escapement:	66	330	66	4,686	66	0	198	5,412
	Standard Error:	65.5	142.8	65.5	203.4	65.5	0.0	112.0	
Strata 6-7: 07/19 - 07/30									
No Samples Collected									
Strata 1-7: 06/14 - 07/30									
Sampling Dates: 06/19 - 07/16									
Female:	Number in Sample:	1	8	1	149	1	0	3	163
	% Females in Age Group:	0.4	4.1	0.4	93.7	0.4	0.0	1.1	100.0
	Estimated % of Escapement:	0.1	1.7	0.1	39.3	0.1	0.0	0.4	41.9
	Estimated Escapement:	66	763	66	17,351	66	0	198	18,510
	Standard Error:	65.5	279.1	65.5	1,171.3	65.5	0.0	112.0	
	Estimated Design Effects:	0.566	0.899	0.566	1.124	0.566	0.000	0.554	1.112
Male:	Number in Sample:	0	7	0	206	1	1	1	216
	% Males in Age Group:	0.0	3.6	0.0	95.1	0.4	0.5	0.3	100.0
	Estimated % of Escapement:	0.0	2.1	0.0	55.2	0.3	0.3	0.2	58.1
	Estimated Escapement:	0	917	0	24,377	114	136	82	25,625
	Standard Error:	0.0	357.3	0.0	1,183.3	175.1	133.7	81.2	
	Estimated Design Effects:	0.000	1.235	0.000	1.110	1.077	1.156	0.703	1.112
Total:	Number in Sample:	1	15	1	355	2	1	4	379
	Estimated % of Escapement:	0.1	3.8	0.1	94.5	0.4	0.3	0.6	100.0
	Estimated Escapement:	66	1,680	66	41,728	180	136	280	44,135 [a]
	Standard Error:	65.5	451.5	65.5	509.4	130.7	135.2	138.4	
	Estimated Design Effects:	0.566	1.089	0.566	0.985	0.827	1.166	0.598	

[a] 1,731 fish that were counted through the weir during strata 6 and 7 are not included in this total.

APPENDIX 8.—Length (mm) at age for sockeye salmon at McLees Lake weir, 2001.

		Brood Year and Age Class						
		1997		1996			1995	
		0.3	1.2	0.4	1.3	2.2	1.4	2.3
Stratum 1: 06/14-06/20								
Sampling Dates: 06/19, 06/20								
Female:	Mean Length				567			
	Std. Error				3.6			
	Range				535-595			
	Sample Size	0	0	0	23	0	0	0
Male:	Mean Length		495		595			615
	Std. Error		---		3.0			---
	Range		---		575-630			---
	Sample Size	0	1	0	36	0	0	1
Stratum 2: 06/21-06/27								
Sampling Dates: 06/21, 06/23, 06/24								
Female:	Mean Length		528		550			
	Std. Error		17.5		2.7			
	Range		510-545		505-590			
	Sample Size	0	2	0	39	0	0	0
Male:	Mean Length		543		579		610	
	Std. Error		15.9		3.1		---	
	Range		525-575		545-620		---	
	Sample Size	0	3	0	42	0	1	0
Stratum 3: 06/28-07/04								
Sampling Dates: 07/01, 07/02								
Female:	Mean Length				549			
	Std. Error				2.8			
	Range				519-571			
	Sample Size	0	0	0	29	0	0	0
Male:	Mean Length		515		572			
	Std. Error		0.5		2.5			
	Range		514-515		536-607			
	Sample Size	0	2	0	43	0	0	0
Stratum 4: 07/05-07/11								
Sampling Dates: 07/06, 07/07, 07/08								
Female:	Mean Length		526		548			
	Std. Error		7.0		3.9			
	Range		519-533		518-599			
	Sample Size	0	2	0	23	0	0	0
Male:	Mean Length				579	524		
	Std. Error				3.2	---		
	Range				510-620	---		
	Sample Size	0	0	0	49	1	0	0

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		Brood Year and Age Class						
		1997		1996			1995	
		0.3	1.2	0.4	1.3	2.2	1.4	2.3
Stratum 5: 07/12-07/18 Sampling Dates: 07/12, 07/13, 07/16								
Female:	Mean Length	541	501	564	551	508		567
	Std. Error	---	16.1	---	3.2	---		24.0
	Range	---	456-529	---	513-585	---		519-592
	Sample Size	1	4	1	35	1	0	3
Male:	Mean Length		512		587			
	Std. Error		---		3.7			
	Range		---		545-632			
	Sample Size	0	1	0	36	0	0	0
Strata 6-7: 07/19-07/30 No Samples Collected								
All Strata								
Female:	Mean Length	541	514	564	552	508		567
	Std. Error	---	9.6	---	1.5	---		24.0
	Range	---	456-545	---	505-599	---		519-592
	Sample Size	1	8	1	149	1	0	3
Male:	Mean Length		524		582	524	610	615
	Std. Error		9.5		1.5	---	---	---
	Range		495-575		510-632	---	---	---
	Sample Size	0	7	0	206	1	1	1
All Fish:	Mean Length	541	518	564	569	516	610	579
	Std. Error	---	6.7	---	1.3	8.0	---	20.8
	Range	---	456-575	---	205-632	508-524	---	519-615
	Sample Size	1	15	1	355	2	1	4